

January 30, 2020

Arthur Burbank
USDA Forest Service
4350 South Cliffs Dr.
Pocatello, ID 83204

**Subject: Biological Selenium Removal Treatment Technology
 Water Treatment Pilot Study
 December 2019 Progress Report**

Dear Art,

This progress report summarizes key activities in December 2019 associated with Phase 2 of the Water Treatment Pilot Study located near Hoopes Spring. This Pilot Study is being conducted as part of the Smoky Canyon Mine Remedial Investigation/Feasibility Study (RI/FS) to provide information on the effectiveness of the active biological treatment system in removing selenium and other COPCs from South Fork Sage Creek Springs and Hoopes Spring.

Work related to the approved Phase 2 Pilot Study continues at the site in accordance with the *Final Phase 2 Pilot Study Work Plan and Sampling and Analysis Plan, Ultra-Filtration/Reverse Osmosis and Biological Selenium Removal Fluidized Bed Bioreactor Treatment Technology* (Phase 2 WP/SAP).

Identification of Deliverables and Data Transmittals

There were no outstanding deliverables or transmittals for the month of December. At the time of this report, we have received laboratory data for Weeks 94 and 96. Preliminary laboratory data are presented in Table 1. The field data for the Weeks 94 and 96 sampling events is summarized in Table 2.

Completed Activities

The following activities associated with the Phase 2 Pilot Study were completed in December 2019:

- Continued system operation and treatment of selenium.

The Treatment System Pilot (TSP) influent total selenium concentration for Week 94 was 174 ug/L and Week 96 was 152 ug/L. The Treatment System Pilot effluent total selenium concentration for Week 94 was 42.6 ug/L and Week 96 was 24.7 ug/L. The average removal efficiency for December was approximately 79.6% for total selenium removal.

The average flow of the TSP for the month of December was 1,485 gpm. The reduced average flow is a result of UF/RO membrane cleaning activities, maintenance work and power outages. Since full scale operations began in early December 2017 approximately 1.698 billion gallons of

impacted water has been treated. The mass of selenium removed from December 2017 through December 2019 is approximately 1,747 pounds.

Upcoming Activities

The following activities associated with the Phase 2 Pilot Study are planned through January 2020:

- Continue system monitoring in accordance with the sampling and analysis plan.

Please contact me if there are questions regarding this monthly progress report.

Sincerely,

A handwritten signature in black ink, appearing to read "Jeffrey Hamilton".

Jeffrey Hamilton
Environmental Engineer

cc:

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Table 1
Laboratory Results Full Analyte List

Hoopes Springs Water Treatment Plant Pilot Study
Phase 2, Performance Monitoring

		Week 94		
Station >>		Influent	Ultra Filtration Backwash	Effluent
Sample ID >>		SC1219-LSSHS-IN001	SC1219-LSSHS-UFB001	SC1219-LSSHS-EF001
Date >>		12/4/2019		
Analyte	Units			
General Chemistry				
Alkalinity, Total as CaCO3	mg/L	200	40	250
Bicarbonate, as CaCO3	mg/L	200	40	250
Carbonate, as CaCO3	mg/L	1 U	1 U	1 U
Hardness, as CaCO3	mg/L	264	49.8	348
Ammonia, as N	mg/L	0.026 U	0.026 U	0.026 U
Biochemical Oxygen Demand	mg/L	2 U	2 U	2 U
Chemical Oxygen Demand	mg/L	5 U	5 U	5 U
Chloride	mg/L	12.8	2.17	21.7
Fluoride	mg/L	0.384	0.0886 J	0.506
Total Dissolved Solids	mg/L	460	132	492
Total Suspended Solids	mg/L	2 U	2 U	2 J
Total Organic Carbon	mg/L	0.5 U	0.5 U	0.5 U
Nutrients				
Nitrate, as N	mg/L	0.36	0.15	1.06
Nitrate + Nitrite, as N	mg/L	0.364	0.154	1.06
Sulfate	mg/L	82.7	10.6	126
Sulfide	mg/L	1 U	1 U	1 U
Phosphorus, Total	mg/L	0.108	0.0539	0.451
Major Cations and Anions				
Calcium, Dissolved	mg/L	66	12.5	87.2
Magnesium, Dissolved	mg/L	24	4.52	31.6
Potassium, Dissolved	mg/L	0.801	0.268 J	1.12
Sodium, Dissolved	mg/L	7.8	2.45	10.3
Metals and Metalloids				
Aluminum, Dissolved	mg/L	0.0148 J	0.0172 J	0.0198 J
Aluminum, Total	mg/L	0.0219 J	0.0381 J	0.0076 U
Antimony, Dissolved	mg/L	0.0000732 U	0.0000732 U	0.0000912 J
Antimony, Total	mg/L	0.0000732 U	0.0000732 U	0.000112 J
Arsenic, Dissolved	mg/L	0.000398 U	0.000398 U	0.000398 U
Arsenic, Total	mg/L	0.000398 U	0.000398 U	0.000398 U
Barium, Dissolved	mg/L	0.0515	0.00986	0.0455
Barium, Total	mg/L	0.0528	0.0102	0.0463
Beryllium, Dissolved	mg/L	0.000047 U	0.000047 U	0.000047 U
Beryllium, Total	mg/L	0.000047 U	0.000047 U	0.000047 U
Boron, Dissolved	mg/L	0.0131 J	0.0091 J	0.0159 J
Boron, Total	mg/L	0.0131 J	0.00959 J	0.0155 J
Cadmium, Dissolved	mg/L	0.0000362 U	0.0000362 U	0.0000362 U
Cadmium, Total	mg/L	0.0000362 U	0.0000362 U	0.0000362 U
Chromium, Dissolved	mg/L	0.000313 J	0.0000433 U	0.0000433 U
Chromium, Total	mg/L	0.000448 J	0.0000738 J	0.000261 J
Cobalt, Dissolved	mg/L	0.0000937 J	0.00021 J	0.00599
Cobalt, Total	mg/L	0.0000971 J	0.000202 J	0.00589
Copper, Dissolved	mg/L	0.0000418 U	0.0000418 U	0.0000418 U
Copper, Total	mg/L	0.0000418 U	0.0000937 J	0.000187 J
Iron, Dissolved	mg/L	0.01 U	0.01 U	0.0251 J
Iron, Total	mg/L	0.0135 J	0.0241 J	0.291
Lead, Dissolved	mg/L	0.0000554 U	0.0000554 U	0.0000554 U
Lead, Total	mg/L	0.0000554 U	0.0000554 U	0.0000554 U
Manganese, Dissolved	mg/L	0.000345 J	0.000467 J	0.00348
Manganese, Total	mg/L	0.00024 J	0.000482 J	0.00376

Table 1
Laboratory Results Full Analyte List

Hoopes Springs Water Treatment Plant Pilot Study
Phase 2, Performance Monitoring

Station >>		Influent	Ultra Filtration Backwash	Effluent
Sample ID >>		SC1219-LSSHS-IN001	SC1219-LSSHS-UFB001	SC1219-LSSHS-EF001
Date >>		12/4/2019		
Analyte	Units			
Mercury, Dissolved	mg/L	0.00008 J	0.000086 J	0.000082 J
Mercury, Total	mg/L	0.000083 J	0.000083 J	0.000078 J
Molybdenum, Dissolved	mg/L	0.00212	0.000343 J	0.0107
Molybdenum, Total	mg/L	0.00214	0.000331 J	0.0111
Nickel, Dissolved	mg/L	0.000305 J	0.0000828 J	0.00594
Nickel, Total	mg/L	0.000329 J	0.0000826 J	0.00639
Selenium, Dissolved	mg/L	0.173	0.0276	0.041
Selenium, Total	mg/L	0.174	0.028	0.0426
Selenium, +4 (selenite)	mg/L	0.00005 U	0.00005 U	0.0318
Selenium, +6 (selenate)	mg/L	0.172	0.0271	0.00588
Silver, Dissolved	mg/L	0.0000172 U	0.0000172 U	0.0000172 U
Silver, Total	mg/L	0.0000172 U	0.0000172 U	0.0000172 U
Thallium, Dissolved	mg/L	0.0000657 U	0.0000657 U	0.0000657 U
Thallium, Total	mg/L	0.0000657 U	0.0000657 U	0.0000657 U
Uranium, Dissolved	mg/L	0.00161	0.000187 J	0.00208
Uranium, Total	mg/L	0.00165	0.000208 J	0.00219
Vanadium, Dissolved	mg/L	0.000706 J	0.00014 U	0.000673 J
Vanadium, Total	mg/L	0.000773 J	0.00014 U	0.000831 J
Zinc, Dissolved	mg/L	0.00428 J	0.00157 J	0.000507 J
Zinc, Total	mg/L	0.00445 J	0.00137 J	0.000523 J

Notes:

Results presented are preliminary, and have not been validated at the time of this report.

U - Analyte not detected above the method detection limit (MDL).

J - Result is estimated.

Table 2
Laboratory Results Focused Analyte List

Hoopes Springs Water Treatment Plant Pilot Study
Phase 2, Performance Monitoring

		Week 96		
Station >>		Influent	Ultra Filtration Backwash	Effluent
Sample ID >>		SC1219-LSSHS-IN002	SC1219-LSSHS-UFB002	SC1219-LSSHS-EF002
Date >>		12/18/2019		
Analyte	Units			
General Chemistry				
Ammonia, as N	mg/L	0.026 U	0.026 U	0.026 U
Biochemical Oxygen Demand	mg/L	2 U	2 U	2 U
TSS	mg/L	2 U	2 U	2 J
Nutrients				
Nitrate, as N	mg/L	0.32	0.21	0.36
Sulfide	mg/L	1 U	1 U	1 U
Phosphorus, Total	mg/L	0.0392	0.0424	0.256
Metals and Metalloids				
Selenium, Dissolved	mg/L	0.172	0.0489	0.0285
Selenium, Total	mg/L	0.152	0.0476	0.0247

Notes:

Results presented are preliminary, and have not been validated at the time of this report.

U - Analyte not detected above the method detection limit (MDL).

J - Result is estimated.

Table 3
Field Water Quality Data

Hoopes Springs Water Treatment Plant Pilot Study
Phase 2, Performance Monitoring

		Parameter >>	Dissolved Oxygen	ORP	pH	SC	Temperature	Turbidity
		Units >>	mg/L	mV	SU	umhos/cm	C	NTU
Station	Sample ID	Date						
Week 94								
Influent	SC1219-LSSHS-IN001	12/4/2019	7.11	67	6.43	485	14.93	0.5
Ultra Filtration Backwash	SC1219-LSSHS-UFB001		5.48	84	7.3	107	14.92	1.2
Effluent	SC1219-LSSHS-EF001		6.28	109	7.43	609	13.56	0.9
Week 96								
Influent	SC1219-LSSHS-IN002	12/18/2019	12.78	40	7.41	501	13.17	0.5
Ultra Filtration Backwash	SC1219-LSSHS-UFB002		6.58	85	7.3	188	13.12	1.7
Effluent	SC1219-LSSHS-EF002		6.3	94	7.42	533	12.89	0.7

Notes: